

The subject with which the author deals is the relation of Japan to the Eastern Question, and therefore to England and Russia. It is a striking fact that such matters should be discussed in an English work by a native of Japan. Mr. Manjiro Inagaki cannot, however, be congratulated on the way in which he sets forth his ideas. His facts are thrown together so loosely that it is sometimes difficult to make out the propositions which he wishes to prove or to illustrate.

LETTERS TO THE EDITOR.

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Indiscriminate Separation, under the Same Environment, a Cause of Divergence.

I HAVE accumulated a large body of facts indicating that separated fragments of a species, though exposed to the same environment, will in time become divergent. I find that, wherever a species possessing very low powers of migration is for many generations divided into a series of fragments by barriers that do not obstruct the distribution of surrounding species, more or less divergence arises in the separated portions of the species, though, in the same areas, there is no divergence in the environing species whose distribution is not obstructed. I still further find that, whenever the distances intervening between the different fragments are an approximate measure of the time and degree of separate breeding (as is frequently the case, as long as the divergence does not involve any physiological and psychological segregation), these distances are also an approximate measure of the degree of divergence.

The validity of this conclusion is called in question because it is inconsistent with the theory that all divergence is due to diversity of natural selection, and that all diversity of natural selection is due to exposure to different environments. The divergences in the cases above referred to, it is said, are probably due to differences in the environment that are not easily recognized. This was the explanation suggested by Darwin when the facts were reported to him in 1872. The division of a species into isolated portions did not seem to him to furnish any factor that could produce divergence unless it was aided by exposure to different external conditions. The same view is expressed in his "Origin of Species," sixth edition, p. 319.

My reply is twofold. (1) The theory that all the divergences in Sandwich Island land mollusks are due to differences in the environment requires us to believe that there are occult influences increasing in difference with each additional mile of separation, and that these influences control the natural selection of the mollusks, but have no influence on any of the other species occupying the same areas. A theory that involves so heavy an assumption cannot be received when a simpler theory is open to us. (2) I believe I can entirely remove this objection, urged against my conclusion on these purely theoretical grounds, by showing that there are certain causes of divergence, not depending on exposure to different environments, that are necessarily introduced by the division of a species into isolated groups; and that, under the influence of these causes, diversity of habits may arise producing diversity of natural selection, even while the fragments are exposed to the same environment.

I have elsewhere called attention to the fact that the independent breeding of separated groups, so far as we can judge, always tends to produce divergence; and I have shown that, when a species is indiscriminately broken into independent fragments, the tendency to divergence will, on the average, vary in direct proportion to the instability of the species, and in inverse proportion to the size of the fragments, for on these factors depends the probable degree of departure of the average characters of the fragment from the average character of the species previous to its being broken into fragments, and, therefore, the degree of segregation.

I wish now to show that the maintenance of certain classes of characters always belonging to an unbroken species is due to a form of selection that can continue only so long, and so far, as

free crossing continues. Reflex selection is a formative principle, depending on the relations in which the members of an inter-generating group of organisms stand to each other, while they continue to inter-generate; but when two portions of an original species have become so divergent as to compete with each other in the same area without crossing, they form incipient species, and each belongs to the environment of the other. While they are members of the same inter-generating group, their mutual influence results in reflex selection, which maintains the correspondence with each other by which power to cross is preserved; while they are members of groups that do not cross, their mutual influence results in mutual selection that inevitably tends toward the preservation of variations that, through greater divergence, best escape from competition. I have elsewhere defined reflex selection as being the exclusive propagation of those better fitted to the relations in which the members of the same species stand to each other, resulting from the failure to propagate of those less fitted. Among those that are equally fitted to the environment of the species, and therefore equally preserved by natural selection, there is often great difference in the degrees of fitness for sustaining such relations to the rest of the species as will secure an opportunity to propagate. To this class of influences belong the different forms of sexual selection through which the sexual instincts and other sexual characters of the different sexes are kept in full co-ordination. In like manner we must believe that the pollen of any species is kept up to its full degree of potency by the constant selection which results from the failure to propagate of the individuals whose pollen is less potent or whose germs are more difficult to fertilize than the average. We cannot call this sexual selection; but we have to class it as the form of reflex selection through which the physiological co-ordination of the male and female elements with each other is so maintained as to secure full fertility. Again, there is a constant selection of animals that are suitably endowed with the recognition marks and calls by which the different members of the species know each other, and that have the corresponding instincts that lead them to associate with their own kind who are thus endowed. I have elsewhere called this principle of social co-ordination "social selection," and have classed it as a form of reflex selection.

There are several other forms of reflex selection. One of these secures harmony in the habits and modes of life of the different members of a freely inter-generating group of organisms; for individuals, whose habits are not sufficiently co-ordinated with those of the mass of the species to allow of their inter-breeding with them, will fail of propagating. This we may call co-ordinative industrial selection. We are now prepared to understand one reason why independent breeding resulting from indiscriminate separation is in time transformed into segregation. Independent breeding is in its very nature the suspension, not only of one form, but of all forms of reflex selection between the separated portions of the species. The importance of the cessation of natural selection in producing the different stages of the degeneration of organs that are disappearing has been fully discussed by Prof. Romanes (see *NATURE*, vol. xli. p. 437, and previous communications there referred to), who points out that, as the power of the special form of heredity by which any organ is produced has been built up by the many generations of natural selection that have acted in favour of the organ, so the gradual weakening of that power follows the cessation of the natural selection. Prof. Weismann seems to appeal to the same principle when he attributes the disappearance of "rudimentary organs" to the action of "panmixia." Now, in the cessation of reflex selection which follows independent breeding, a similar principle is introduced, and the inevitable result must be the weakening of the power of heredity by which the portions of the species were held in correspondence with each other before their separation. I have elsewhere shown that separate breeding necessarily disturbs unstable adjustments; and we here see that the most stable of the adjustments by which each part of a species is kept in correspondence with every other part gradually becomes unstable under the continued influence of separation. Whenever a species is divided into two portions that do not interbreed, the four forms of reflex selection above described will cease to act between the two portions, and they will continue in sexual, social, physiological, and industrial harmony with each other, only in so far as the force of the old heredity holds them to the old standards. But the power of heredity in these respects will in time fail, if reflex selection is entirely removed. If the

separate breeding is long continued, incompatibility in all these respects tends gradually to arise; but it is manifest that incompatibility of industrial habits implies diversity in the forms of natural selection that shape each portion. I therefore maintain that separation which necessarily includes the cessation of reflex selection between the portions separated is a cause of segregation and divergence, and that it introduces diversity of natural selection, which is a still further cause of divergence.

Unless the separated portions of a species possess exactly the same average character (which we must believe is seldom, if ever, the case), separation must, from the first, be more or less segregative; and even in cases where the portions completely correspond in character (if there are any such cases), the cessation of reflex selection which is involved in the separate breeding, must result in segregation as soon as the power of heredity begins to weaken; and this is in due time followed by other forms of intensive segregation. I therefore conclude that indiscriminate separation may be regarded as a preliminary form of segregation (*i.e.* discriminate separation), and that in the nomenclature we ordinarily use both principles may be called "segregation" without confusion.

26, Concession, Osaka, Japan.

JOHN T. GULICK.

The Affinities of *Heliopora carulea*.

IN Prof. Moseley's admirable account of the structure and affinities of *Heliopora*, published in the Transactions of the Royal Society, 1876, and afterwards in the *Challenger* Reports, there occurs the following passage: "... directly the coral (*i.e.* *Heliopora*) was left at rest a swarm of a species of *Leucodora*, closely resembling *Leucodora nasuta*, which infests the coral and perforates it all over, expanded themselves at once."

This will probably explain the cause of the curious mistake that Mr. Saville Kent has made, in his letter published in last week's NATURE (p. 340), in supposing that *Heliopora* is a tubicolous annelid. *Heliopora* is not a tubicolous annelid, nor does it belong to the "Hydrozoic division of the Coelenterata," but it is, without a shadow of doubt, as Moseley described it to be, an Alcyonarian.

When I was preparing my paper on the "Siphonoglyphe in the stomodæum of Alcyonarians" in 1883, Prof. Moseley kindly placed at my disposal his preparations of *Heliopora*, and I was able then fully to confirm his conclusions as to the Alcyonarian nature of this interesting coral.

During my visits to the coral reefs on the coasts of North Celebes and the adjacent islands, I came across many large and beautiful specimens of *Heliopora*, some of which I carefully preserved for further investigation at home. I never found the polyps fully expanded with the eight pinnate tentacles standing out from the disk like the petals of a flower, but in the few instances when I saw the polyps protruded $\frac{1}{2}$ inch or thereabouts from the surface of the coral the tentacles were partially withdrawn, so that their characteristic features were hidden.

Since my return from Celebes I have made a large number of sections of the material I brought back with me with a view to the publication of a short paper on some further details of its anatomy, and I have recently been able to supplement this by a series of preparations I have made from the excellent material given to me by Prof. Haddon, who found *Heliopora* in abundance in Torres Straits.

I will not venture, in the present state of my investigation, to state my opinion as to the position that *Heliopora* should occupy in the group to which it undoubtedly belongs; I merely wish to call the attention of the readers of NATURE to the fact that its Alcyonarian characters are beyond dispute.

Downing College, August 9.

SYDNEY J. HICKSON.

Meteors.

LAST night, between 11.12 and 11.52, I and another observer saw altogether eighty-three meteors, eighty of which were Perseids. Some of them were very brilliant, especially those near the neighbourhood of Aquila.

The remaining three meteors had different paths, one having a direction exactly opposite to that of the Perseids.

The other observer was watching the radiant point and the region around it, while I observed the south-west quadrant.

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More observations would have been made, but were interrupted by clouds.

W. J. LOCKYER.

Observatory House, Westgate-on-Sea, August 12.

A LIQUID COMPOUND OF NICKEL AND CARBON MONOXIDE.

IN the August number of the Journal of the Chemical Society a full account is given of the remarkable new compound described by Mr. Mond, in conjunction with Drs. Langer and Quincke, at the last meeting of the Chemical Society. The following is an outline of the main facts described in their communication.

Carbon monoxide is found to be affected in a very curious manner when passed over finely divided metallic nickel heated to a temperature of 350°–450° C. The metal becomes converted into a black amorphous powder containing nickel and carbon, the carbon monoxide becoming at the same time changed into the dioxide owing to the loss of carbon. A comparatively small amount of nickel is capable of decomposing a very large quantity of carbon monoxide, and at the commencement of the operation the gas may be passed over at a very rapid rate without any escaping decomposition. As the operation continues, the change becomes less and less complete, but even after numerous repetitions of the experiment carbonic anhydride continues to be formed. The solid product of the reaction appears to vary in composition somewhat widely according to the temperature and the time during which the operation is carried on. The highest proportion of carbon found was 85 per cent. Some time ago MM. Gautier and Hallopeau obtained a similar product, containing 80 per cent. of carbon, by the action of carbon bisulphide upon metallic nickel. The nickel is only partially removed by acids, for even after repeated extraction the whole of the nickel is not found in solution.

When this black substance was allowed to cool in the current of carbon monoxide another change was found to occur, with production of some volatile substance, whose vapour rendered a non-luminous Bunsen gas flame placed in its path highly luminous. Further, on heating a portion of the tube near the exit a mirror of metallic nickel was obtained mixed with a little carbon. Evidently a gaseous substance containing nickel was contained in the issuing gas, a circumstance of considerable importance in view of the non-volatility of the ordinary known compounds of nickel. Experiments were then made with the idea of obtaining larger quantities of the new substance and isolating it from the other gaseous products. It was eventually found that when finely divided nickel, obtained by reducing nickel oxide in a current of hydrogen at a temperature of about 400°, is allowed to cool in a slow stream of carbonic oxide, the latter gas is very readily absorbed as soon as the temperature has fallen to about 100°. If the current of carbon monoxide is continued, or if that gas is replaced by an inert gas, such as carbon dioxide, nitrogen, or even hydrogen or air, the issuing gas carries away with it large quantities of the new nickel-containing vapour. After about an hour the quantity of this vapour evolved becomes less, and finally its evolution ceases. The property of the nickel to produce it is restored by heating it to 400° again and allowing once more to cool; indeed, up to a certain limit it forms the compound more abundantly after repeated use. If the issuing gas is collected and heated to 150°, its volume is found to largely increase, nickel more or less contaminated with carbon being deposited. At a temperature of 180° the nickel deposited was found to be quite free from carbon.

The new volatile compound was eventually isolated by leading the mixed issuing gases through condensers placed in a freezing mixture of ice and salt, in which the vapours condensed to a colourless mobile liquid of very high refractive power.